China Unicom's Researches on co-construction and sharing of 5G MEC

Gao Chen,
China Unicom Research Institute

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What is GSMA Open Gateway?

GSMA Open Gateway is **a framework of common network Application Programmable Interfaces (APIs)** designed to provide universal access to operator networks for developers.

- **The biggest achievement** of MWC 2023 by GSMA

  This move represents **a paradigm shift** in the way the telecoms industry designs and delivers services in an API economy word.

- Participating operators will commercially **launch and federate** at least one CAMARA APIs in 2023

Published in MWC Barcelona 2023 by GSMA
(February 27th 2023)

Launched with the support of **21 mobile network operators**, including China Mobile

What is CAMARA?

CAMARA is **a Open Source Project** within Linux Foundation to define, develop and test the APIs. CAMARA works in close collaboration with the **GSMA Operator Platform Group (OPG)** to align API requirements and publish API definitions and APIs.

- API definitions and reference implementations are free to use (**Apache2.0 license**)
- Harmonization of APIs is achieved through fast and agile created working code with development-friendly documentation.

Launched at MWC Barcelona 2022,
to standardize developer facing APIs

- 50+ Named Partners
- Many more partners participating in calls but no name contribution yes, such as China Unicom

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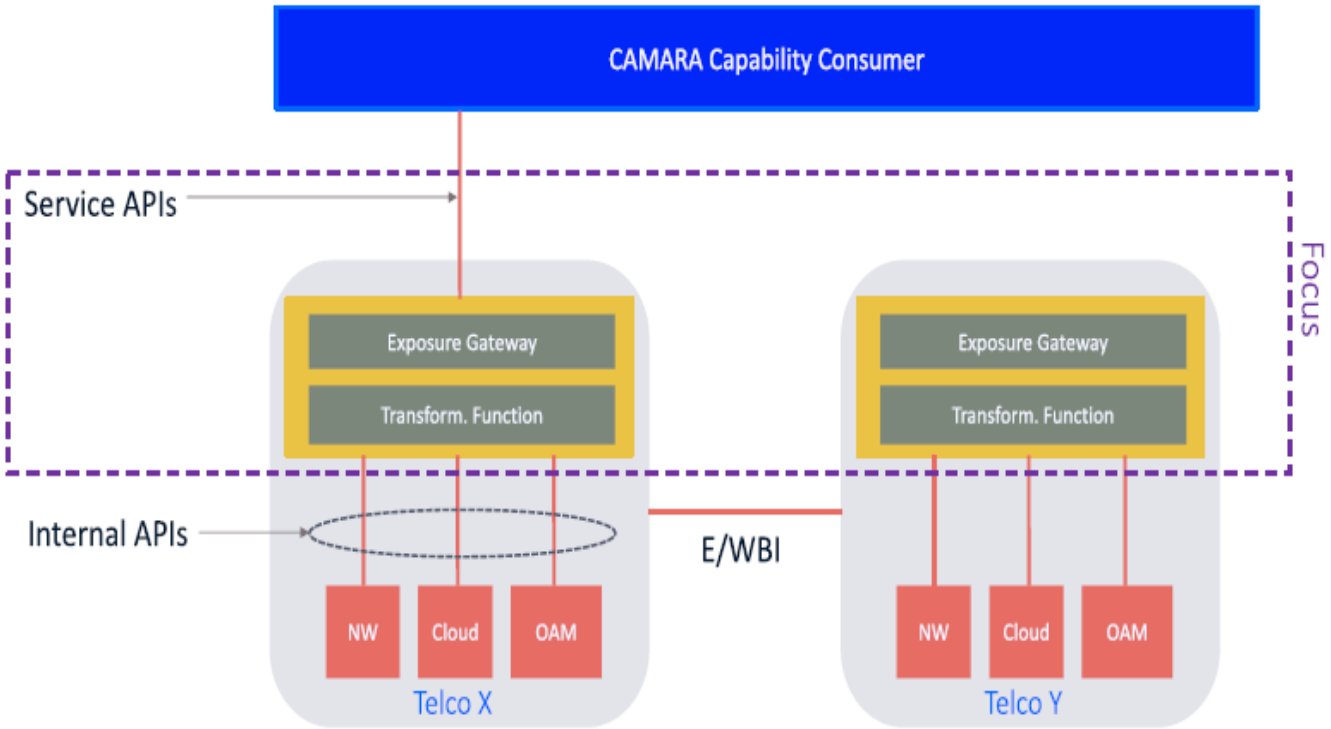
Service APIs published or defined by CAMARA

- Abstraction from Network APIs to **Service APIs** (aka CAMARA APIs)

  Service APIs enable easy and seamless access to Telco network capabilities by simplifying telco network complexity with no telco expertise.

- Availability across telco networks and countries

  GSMA Federation APIs (EWBI) provide federated access to global network capabilities.



CARAMA technical scope

Source: GSMA Technical Group Report

No	API Title	API Description
1	Location Verification	Checks location of device against provided location and confirms geographic area
2	Device Status	Checks if a device is connected to the network and/or is roaming
3	Quality On Demand	Sets the priority of a traffic flow to deliver improved performance to an application
4	Edge Site Selection and Routing	Identifies the optimal Edge-Cloud for a device. Ensures optimal routing towards the edge cloud
5	SIM Swap	Checks the last time that the device associated with a SIM was changed
6	Number Verification	Check of a number via a mobile network
7	OTA Verification	Sends an SMS or Call with an access code to a given number to verify that the number is correct
8	Carrier Billing Check Out	Purchase and payment of products and services in a digital ecosystem using a customer's bill

CAMARA APIs examples

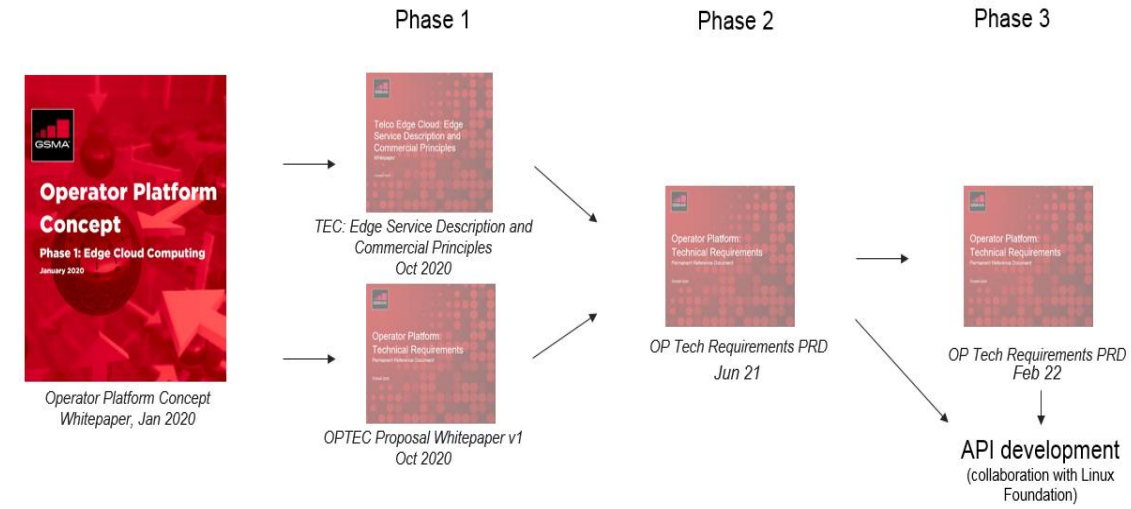
Source: GSMA and https://github.com/camaraproject

NOTE: E/WBI stands for East/Westbound Interface, and calls for federation capabilities across telco operators. This is transparent to 3rd parties (CAMARA capability consumers).

What is GSMA OPG?

OPG defines the technical framework of the Operator Platform (OP), Provides the OP platform reference technology architecture. Its work has included 3 phases as following:

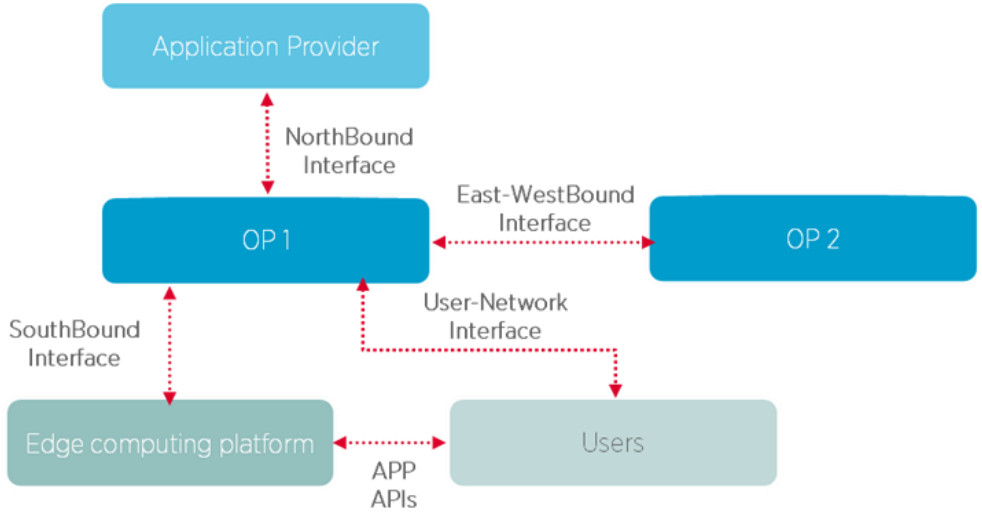
- Phase1 define the concept of OP&TEC
- Phase 2 delivered the first drop of requirements
- Phase 3 and future releases build and enhance requirements and focuses on API development and contribution to Linux Foundation: Project CAMARA



GSMA OPG work and published documents

30+ industrial partners

40+ Operators

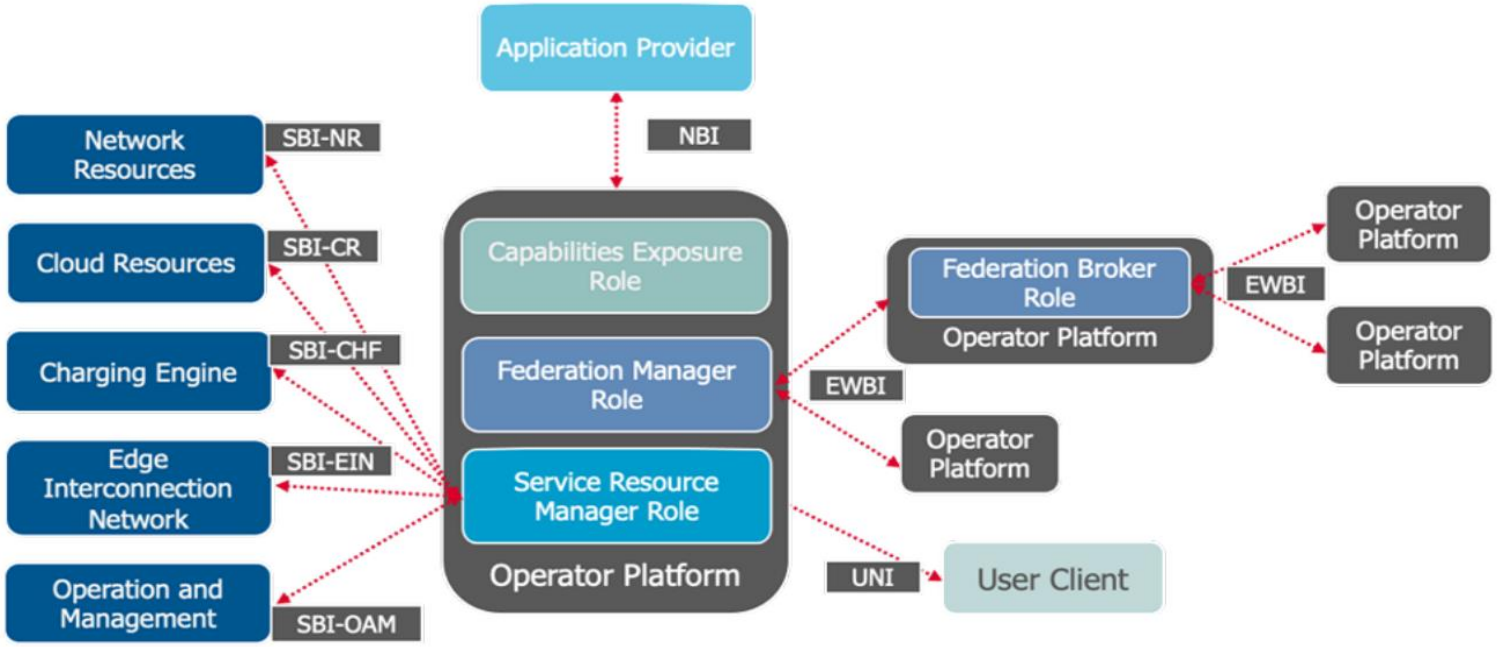


High level reference architecture of GSMA OP

What is OPAG?

OPAG (OP API Group) is the API subgroup of GSMA OPG, dedicated to define, design, and develop APIs required for different OP interfaces

- **North Bound Interface (NBI)** allows to advertise capabilities
- **South Bound Interface (SBI)** allows to consume the information and requests resources
- **East-West Bound Interface (EWBI)** allows to connect to the partner OPs

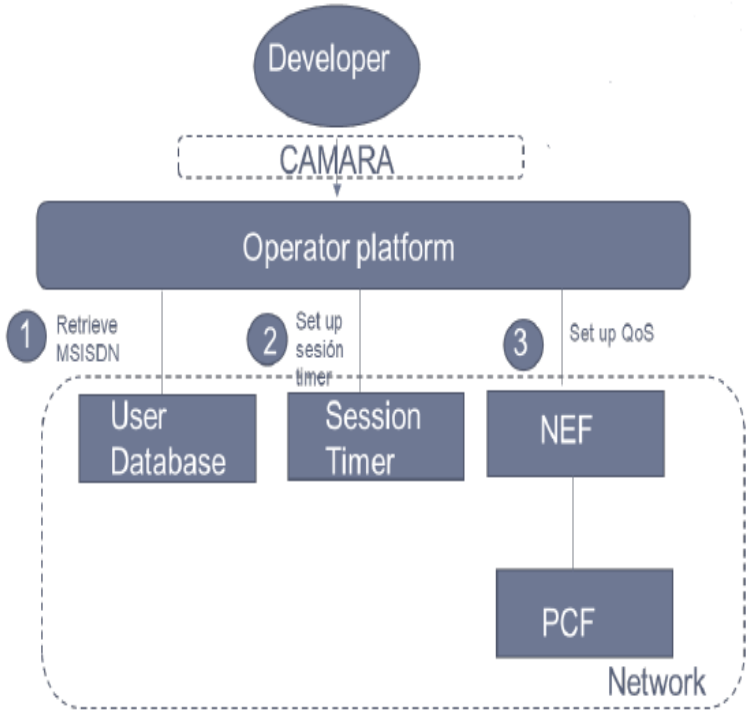


The interfaces of GSMA OP and the role of OP

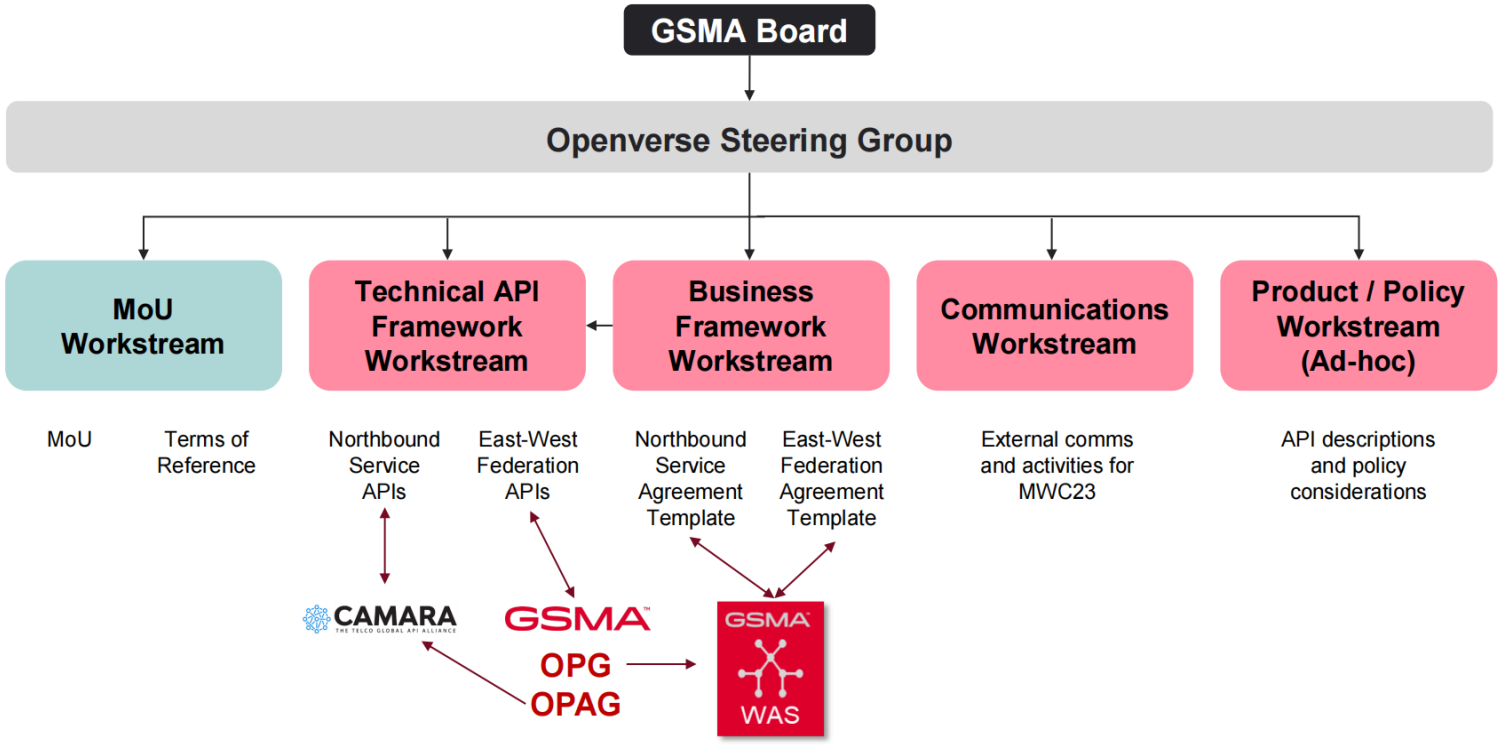
NOTE: The interface specifications such as NBI and EWBI have been released by GSMA OP

What is the relationship between Open Gateway and CARAMA/OPG/OPAG?

- **North Bound Interface (NBI)** via CAMARA & GSMA Agreement Templates
- **East West Bound Interface (EWBI)** via GSMA Operator Platform (OPG) specifications & Business Agreement Templates



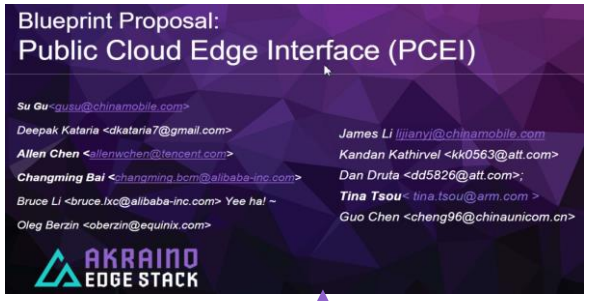
CAMARA and Operator platform value for Open Gateway

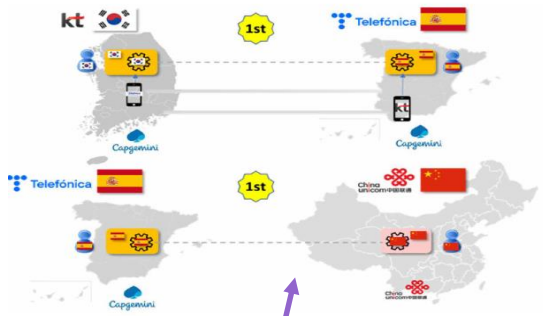


Open Gateway – Steering Group & Work Stream

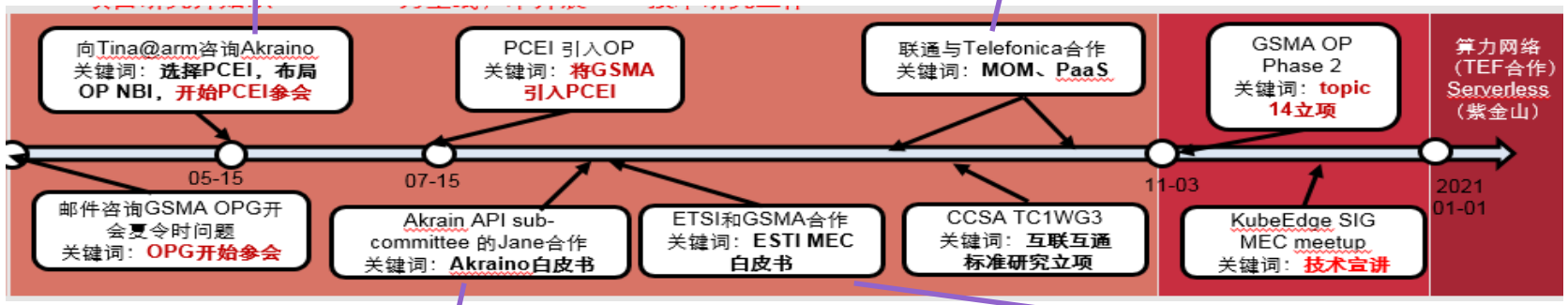
Source: GSMA Project update to GSMA Technology Group, Barcelona, 25th February 2023

China Unicom`s works in GSMA OP





April 2020



Now 2023

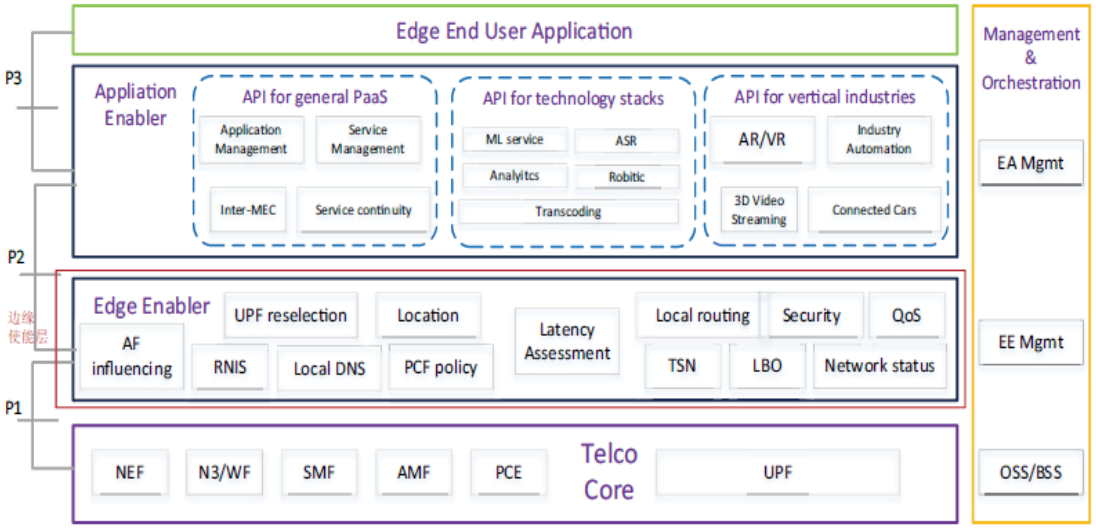
LF Edge Akraino White Paper
https://www.lfedge.org/resources/publications/

ETSI MEC White Paper
https://www.etsi.org/newsroom/news/1806-2020-07-new-etsi-white-paper-harmonizing-standards-for-edge-computing-a-synergized-architecture-leveraging-etsi-isg-mec-and-3gpp-specifications

LF Edge Akraino PCEI (Public Cloud Edge Interface)

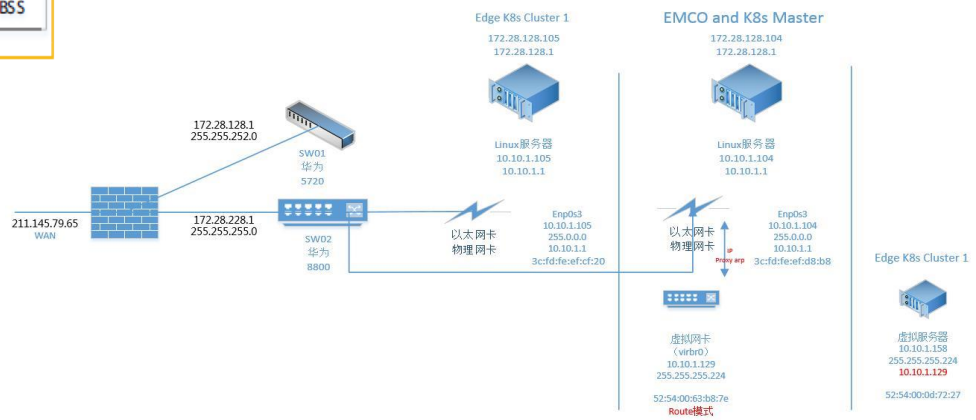
PCEI collaborate with partners to propose enabler layers between edge applications and Telco core networks which provide edge application developer friendly APIs without extensive Telco network knowledge.

- Winner of the 1st Akraino Annual Awards
- LF Edge Akraino White Paper "Cloud Interfacing at the Telco 5G Edge"
- Deploying PCEI R4 second Lab in China Unicom Lab & Introducing PCEI to GSMA OP as a kind of PaaS implementation



Introducing PCEI to GSMA OP

LF Edge Akraino White Paper
https://www.lfedge.org/resources/publications/



Deployment diagram of PCEI R4 in China Unicom

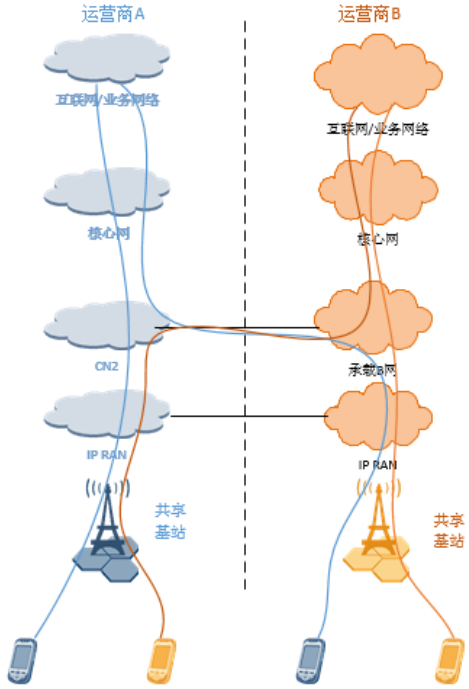
Winner of the 1st Akraino Annual Awards
https://wiki.akraino.org/display/AK/Winners+of+the+1st+Akraino+Annual+Awards

source:
https://www.credly.com/go/nAJvFWyB10DBv1u0HEo3MQ

China Unicom`s perspective on GSMA OP

China Unicom's goal is not just to implement an kind of "OP" platform, but to track and master the key technologies of MEC platform interconnection involved in the GSMA OP project, support the interconnection of heterogeneous edge computing platforms of different manufacturers, and create an open ecosystem of edge computing.

- In the scenario of 5G network co-construction and sharing, 5G MEC & Edge Cloud needs to achieve the "co-construction and sharing" or "interconnection and interworking“
- The edge computing node of a Operator shouldn`t been "disconnected" from the one of the other Operators or Hyperscalers
- Key technologies for co-construction & sharing 5G MEC include:
  - ✓ **MEC Architecture mapping**
  - ✓ **PaaS**
  - ✓ **Edge Node Sharing**
  - ✓ **Edge Interconnection Network (EIN)**



5G Network co-construction & sharing, China Unicom & China Telecom

source：https://mp.weixin.qq.com/s/P1uUdz1eATPDgYHphBvVTg

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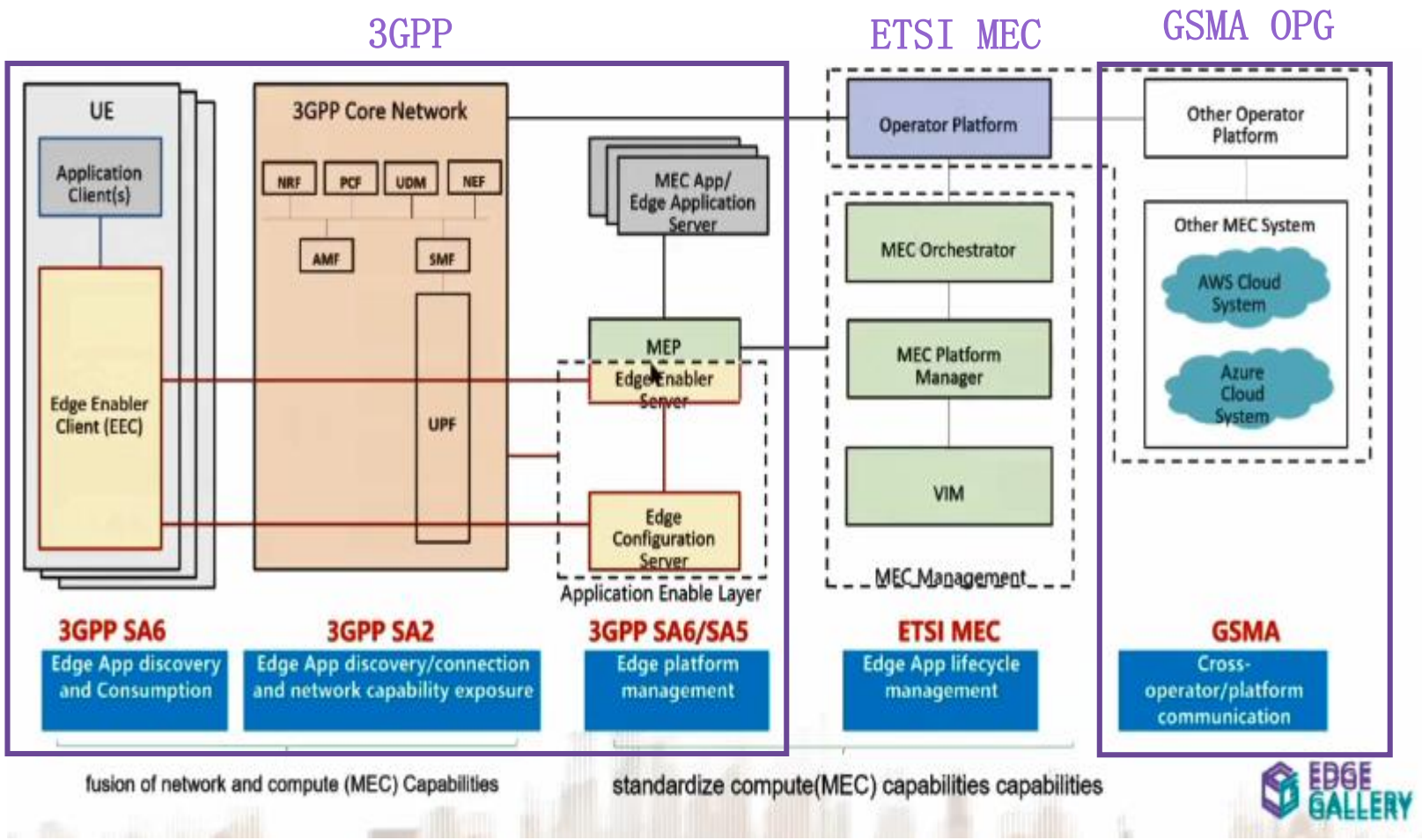
Key Technologies – Architecture Mapping: MEC standardization Organization



The relationship between 3 major MEC standardize organizations, i.e. 3GPP, ETSI MEC and GSMA

Source: 5G PPP Edge Computing webinar, 20 April 2021, Edge Gallery 5G MEC Open source and its Application in IIoT

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Key Technologies – Architecture Mapping – from ETSI MEC to GSMA OP

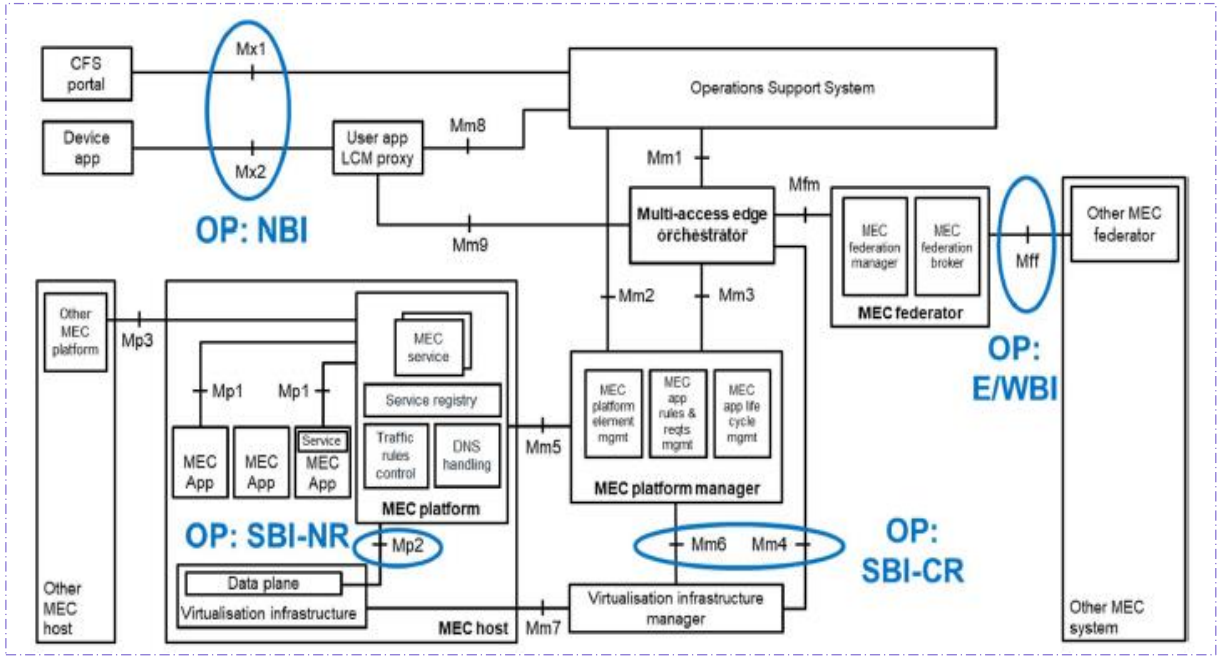


Fig 1. Mapping between the E/WBI, NBI and SBI interfaces of GSMA OP to reference architecture variant for MEC federation

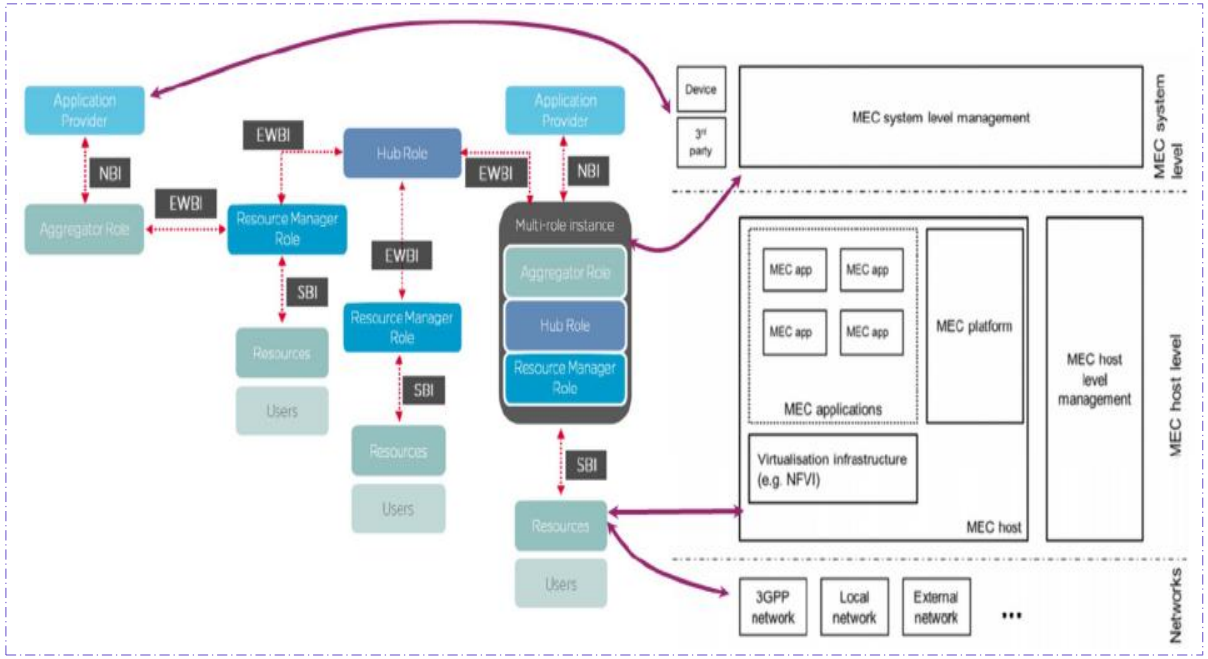


Fig 2. Relationship between ETSI MEC architecture and ETSI MEC framework

Source: ESTI GS MEC 003 - Framework and Reference Architecture - v3.1.1 - 2022-03

Key Technologies – Architecture Mapping – from 3GPP EDGEAPP to both GSMA OP and ETSI MEC

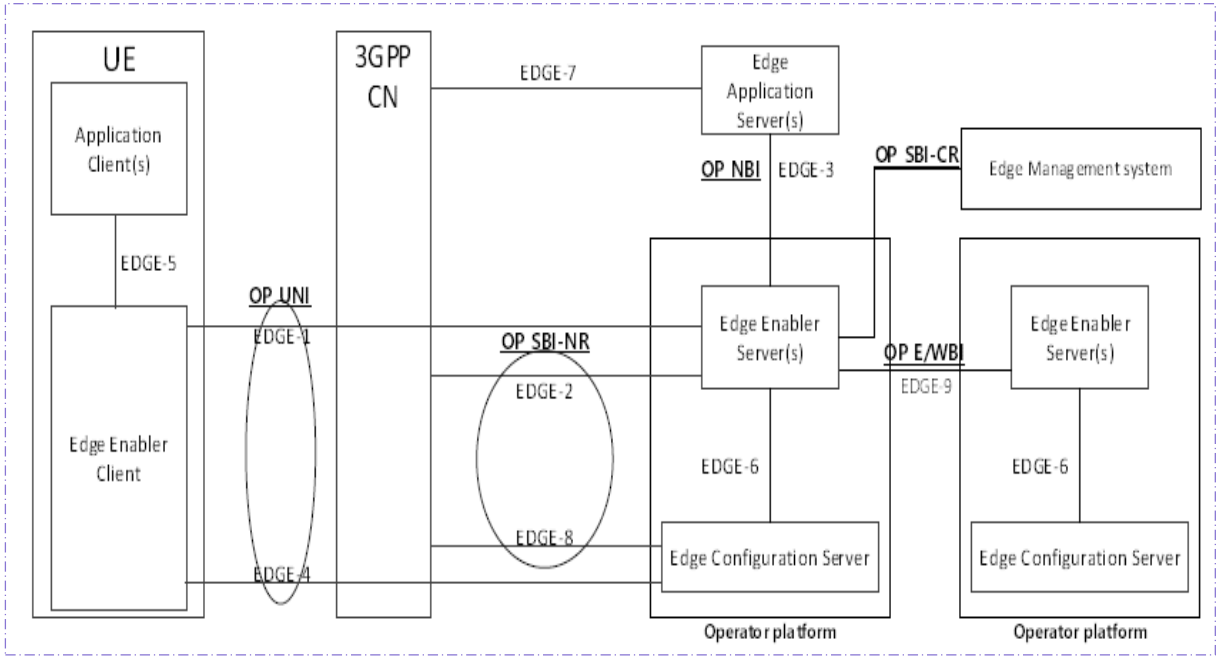


Fig 1. Relationship between 3GPP EDGEAPP and GSMA OP

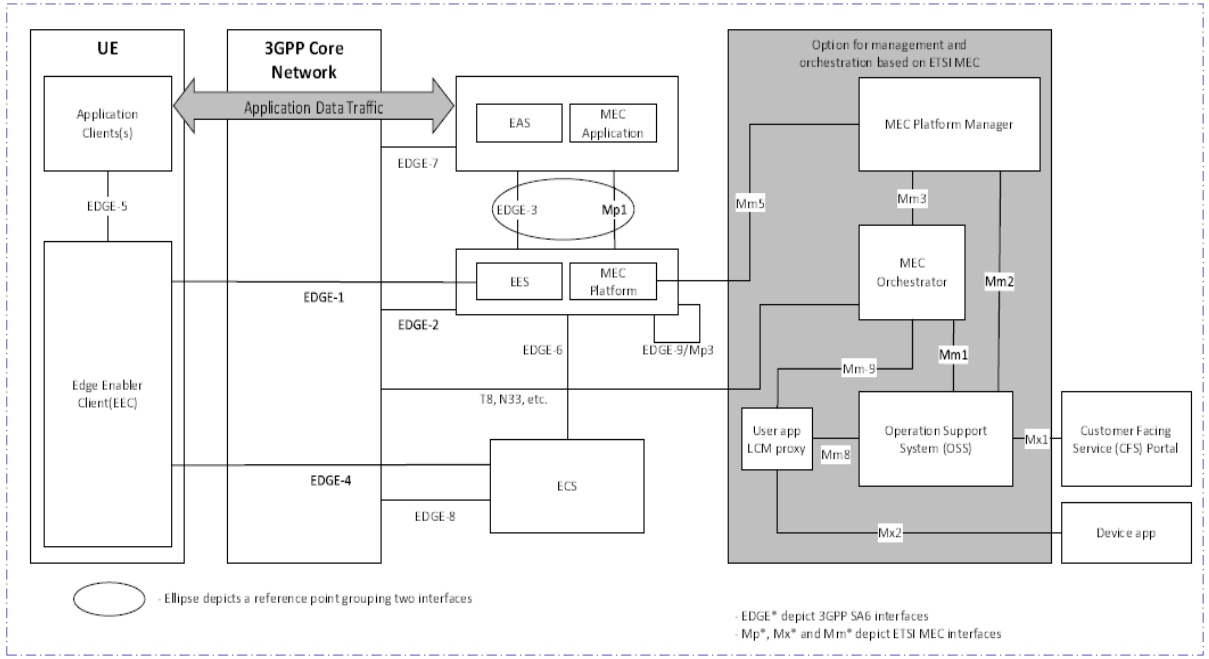


Fig 2. Relationship between 3GPP EDGEAPP and ETSI MEC

Source: ETSI TS 123 558 v17.3.0 (2022-05) - 5G architecture for enabling Edge Applications (3GPP TS 23.558 version 17.3.0 Release 17)

Key Technologies – How to implement PaaS?

OP topic prioritisation

Rank	Topic	MosCow	Owners	Contributors
1	API gap analysis with SDO & Associations, specifying API gaps	**Must have**	Plenary	BT, DT, Optare Solutions, Telefonica, Nokia, Telus
2	Use case and capabilities	**Must have**	BT	BT, DT, Telefonica, Summit Tech, Telus
3	Service access by devices that are attached to networks other than their home network (e.g. roaming, Wi-Fi, service discovery etc.)	**Must have**	Telefonica	BT, DT, Telefonica, Summit Tech
4	Access to OP services in a network different from the one to which the device is attached (e.g. those provided on another operator's network)	**Must have**	Altran, Telefonica	BT, DT, Optare Solutions, Telefonica
5	Device mobility	**Must Have**		Altran, BT, DT, Optare Solutions, Telefonica
6	Changes resulting from the commercial principles whitepaper	Should have	Telefonica	BT, DT, Telefonica
7	Security considerations	**Must have**	Intel	BT, DT, Telefonica
8	Call flows	**Must have**	Telefonica	BT, DT, Telefonica
9	NEW TOPIC: Edge features landscaping (proposed by Intel)	Could have	Intel	BT, DT, Telefonica, Telus
10	Low latency interaction between OP applications in different networks	Should have	Altran	BT, DT, Telefonica
11	Serverless models	Cloud have		Altran, DT, Telefonica
12	Management plane	Clould have		BT, DT, Optare Solutions, Telefonica
13	Local interfaces on an end-user device	Should have		BT, DT, Telefonica
14	NEW TOPIC: Building OP as a PaaS supporting multi-cloud and hybrid cloud with Cloud Native Technologies (proposed by China Unicom)	Could have		BT, DT, Optare Solutions, Telefonica, Summit Tech, Telus
15	Resource reservation	Should have	Telefonica	BT, DT, Telefonica

2020 GSMA OP research topics list

China Unicom proposed to set up a NEW TOPIC:

Building OP as a PaaS supporting multi-cloud and hybrid cloud with Cloud Native Technologies

August 2022, GSMA OP research topics survey

China Unicom has selected 3 topics on which we would make contributions

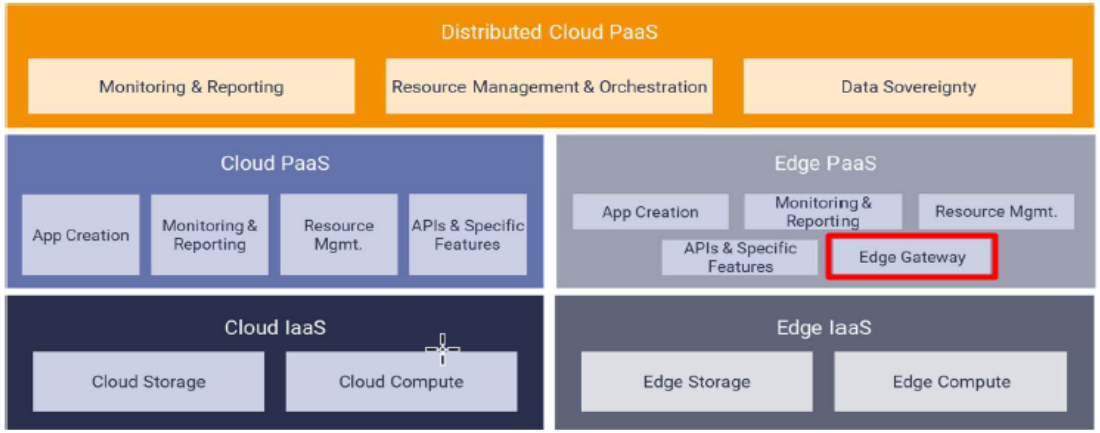
"Zero" jitter

Key Technologies – What is the main difference between Hyperscaler`s and Operator`s PaaS?

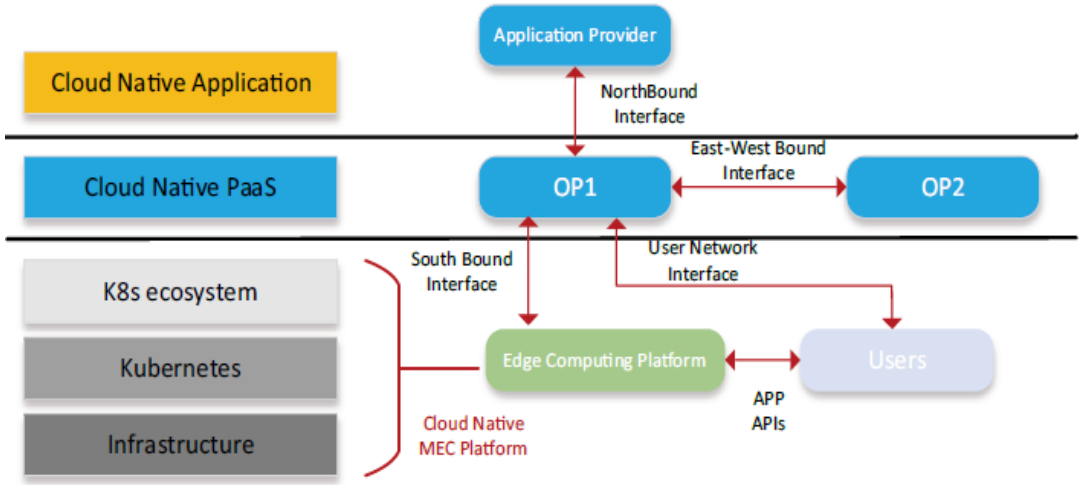
- **NaaS is an operator specific service functionality**
  - ✓ Running on top of the IaaS is the **MEC application platform, or Edge PaaS**, which enables services such as traffic routing and API gateway function
  - ✓ **New PaaS Architecture: Two Layers PaaS**

For more details, please refer to our published paper “Research on Architecture Design of Network Cloud Native PaaS Platform”, which has been awarded as **one of the top ten best papers** on the magazine of “Information and Communication Technology” in 2020

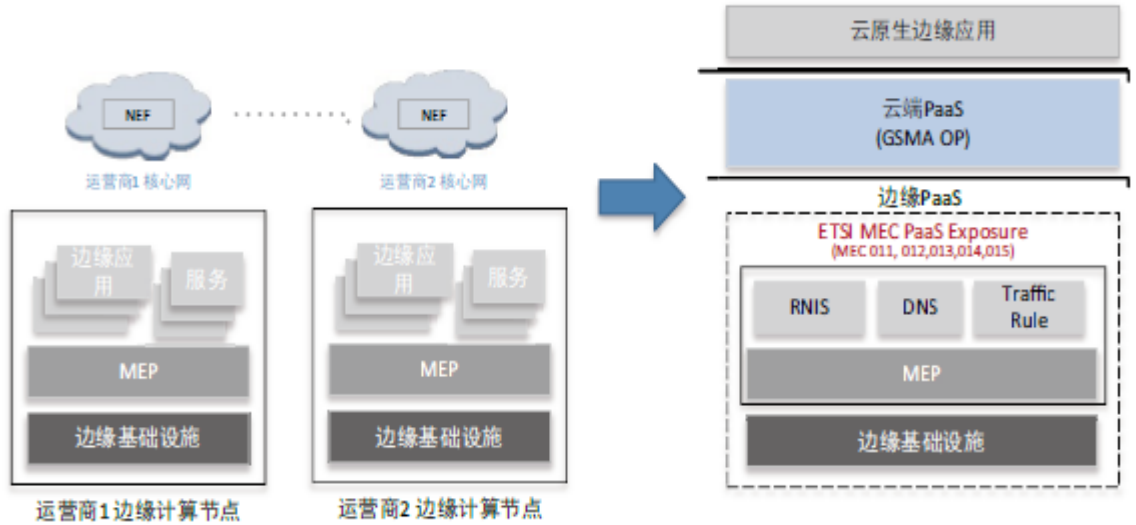
Figure 3: Edge computing platform architecture



Source: https://stlpartners.com/edge-computing-research



Cloud Native PaaS --- a way to implement GSMA OP



A New Architecture: Two layers PaaS

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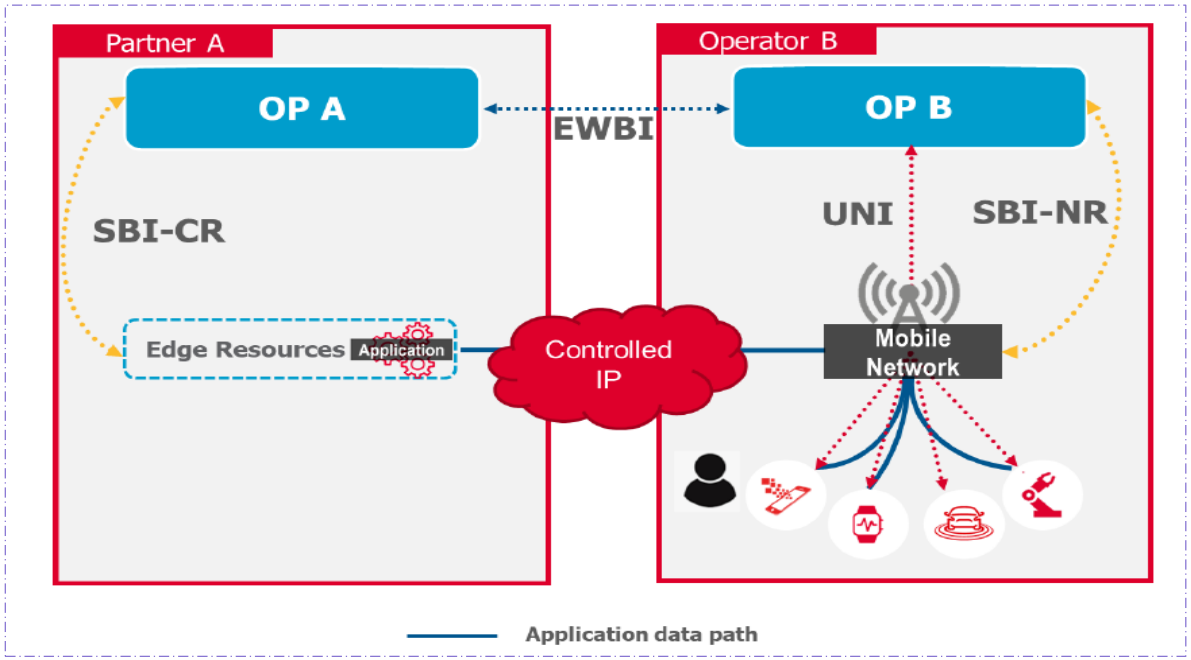
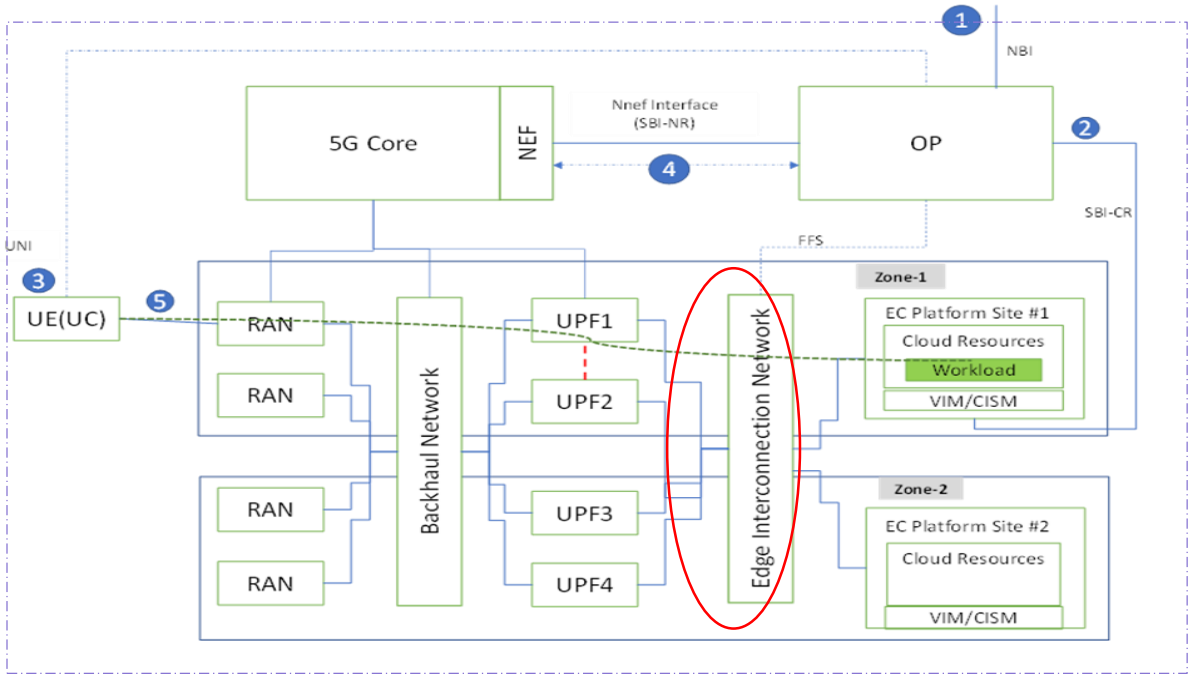
Key Technologies – Edge Node Sharing and EIN(Edge Interconnection Network)

Edge Node Sharing: Two operators may decide to share edge nodes to maximise their edge presence.

EIN is an interface between two edge cloud instances. GSMA OP can use it for edge application relocations and application state synchronization across Cloudlets.





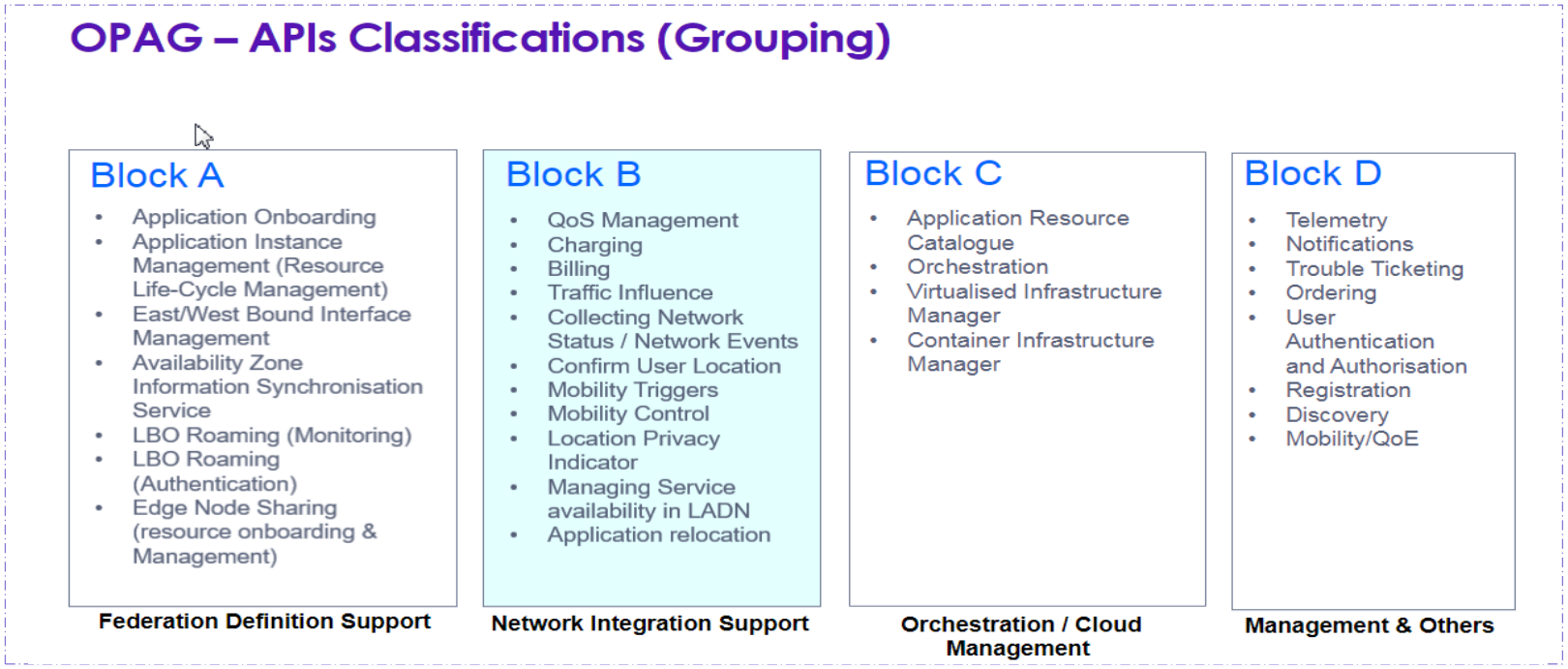
Source: OPG.02 Operator Platform Telco Edge Requirements v3.0

NOTE: Edge Node Sharing and Edge Interconnection Network is to be explored as GSMA OPG proceed with CN (Concept Note) and CR (Change Request)

Wrap up & Questions

There are four Blocks in OPAG as shown in following figure. At this moment, there is still no leader for Block C since the start of OPAG.

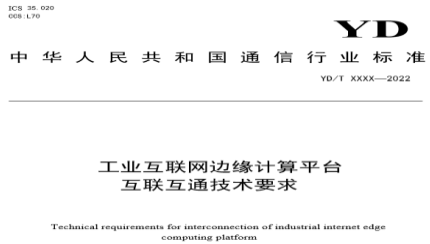
- Who is interested in the work of Block C?



source – GSMA OPAG minutes, February 2023

国内相关工作：

1. TC1 WG5 **《边缘计算平台互联互通技术研究报告》**，2023-03月结项，着手准备申请行业标准
2. 中国通信协会团体标准**《5G MEC 基础设施共建共享技术要求》**、**《5G MEC 基础设施共建共享测试要求》** 2021年立项
3. 工业互联网产业联盟标准项目**《边缘计算节点互联互通》**， 2021-12-22工业互联网产业联盟第十八次工作组会议立项



Thank you.

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